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Shehata, Waled; Langston, Craig Ashley; Sarvimaki, Selja; Novak Camozzi, Ranka

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The Adaptive Reuse Potential of Underused Heritage Gaols in Australia: A case study of Richmond Gaol, Tasmania

Waled Shehata[a]*, C. Langston[b], M. Sarvimäki[a], and R. Novak Camozzi[b]

[a]*Abedian School of Architecture, Faculty of Society and Design, Bond University, Gold Coast, Australia;* [b]*Faculty of Society and Design, Bond University, Gold Coast, Australia*

*waled.shehata@student.bond.edu.au

+61431160996

ORCID iD: https://orcid.org/0000-0002-0065-5598

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Many heritage-listed gaols in Australia have become obsolete in terms of their original function and were decommissioned decades ago. As a default management practice, decommissioned gaols are usually transformed into museums which are mostly empty and underused without considering other viable alternatives. This research challenges this mainstream thinking and demonstrates that among the entire stock of heritage-listed gaols in Australia, even the least ranked gaol in terms of its potential for reuse can be turned into a thriving and vibrant new function. To validate this assumption, this research utilises architectural design in an empirical research paradigm. First, the Adaptive Reuse Potential model (ARP) is applied to rank Australia's decommissioned heritage gaols which are spatially and structurally sound to accommodate new uses. Secondly, an architectural design concept was designed to adaptively reuse the lowest scored gaol (Richmond Gaol) to a boutique hotel. The conceptual design proposal was then assessed by three local heritage architecture firms to validate its applicability and viability. Despite the limitations in the case of Richmond Gaol, in-depth interviews with the architects showed that the gaol can be reused successfully to at least one function, and accordingly, the whole stock of heritage gaols can be expected to also be reused to more sustainable purposes. The research identifies several considerations for the reuse of heritage gaols in Australia: the careful intervention to their significant fabric; maintaining sufficient evidence of the gaol's original components, the importance of the new use being compatible to the gaol's morphology to ensure minimum alterations or demolitions in the significant fabric of the site; and evaluating the new use and its components to achieve financial viability. Challenges discussed in this research encourage creating nationally-designed support programs to better vitalise and help preserve Australia's carceral heritage.

Keywords: adaptive reuse, heritage revitalisation, architecture, heritage gaols, ARP model, Richmond Gaol

Introduction

Adaptive reuse generally refers to the conservation process of unused or obsolete heritage buildings through their conversion for new uses and more appropriate functions (Australia ICOMOS, 2013, article 1.9). Urban development creates pressures for urban

regeneration, which occurs through the functional use and reuse of historical buildings and sites (Plevoets & Van Cleempoel, 2019). In contemporary theory and practice, adaptive reuse is increasingly considered one of the main processes to deal with architectural heritage (Semes, 2012; Shehata, Moustafa, Sherif, & Botros, 2015). The basic notion of heritage adaptive reuse favours 'reuse' than 'new construction' from the perspective of sustainable development (Bullen & Love, 2010). Breathing 'new life' into existing buildings carries with it environmental, economic, and social benefits and helps to retain our national heritage. The adaptive reuse of heritage buildings is an alternative to traditional demolition and reconstruction that entails less energy and waste (Douglas, 2006), assists in finding financial solutions to sustainably maintain significant cultural heritage (Plevoets & Van Cleempoel, 2011; Semes, 2012), and contributes to the improvement of the economic, environmental, and social conditions of the surrounding area (Bullen & Love, 2010; Rezaei, Rasouli, & Azhdari, 2018; Rodwell, 2008). Adaptive reuse has been successfully applied in many types of facilities, including defence estates, airfields, government buildings, modern heritage (Koolhaas, 2014), and industrial buildings (Langston, 2012). Around the world, adaptive reuse of historic buildings is seen as fundamental to sound government policy and sustainable development. In Australia, an increase in the proportion of capital expenditure directed to refurbishment works in recent years indicate that this trend will continue (Department of the Environment, 2009; Langston, 2011b), even when it comes to buildings with uncomfortable (dark) history such as gaols (Shehata, Langston, & Sarvimäki, 2018).

Australia's Heritage Gaols

Penal institutions during and after convict transportation in Australia's history are rich. It is important to preserve them for future generations (Casella & Fennelly, 2016; "UNESCO World Heritage List: Australian Convict Sites," 2010) despite holding uncomfortable connotations (Witcomb, 2012). Modern Australia was founded on the sweat, sorrow and suffering of felons forced to migrate across the seas to another hemisphere, a new world. Not only early convicts but also, after the end of the transportation era, the repeatedly incarcerated of new offenders helped build Australia's early settlement using low-cost labour (Lennon, 2008). Walled gaols accommodated this population and kept them away from free settlers. With the rise of modern rehabilitation methods in the second half of the 20th Century, many of these gaols became obsolete and were decommissioned. Different fates awaited these gaols.

Figure 1 shows that the number of gaols constructed before the 20th Century or those later but listed as heritage buildings compose 84 gaols (Shehata et al., 2018; Shehata, Langston, Sarvimaki, & Smith, in press)[1]. With only 14 of them still in operation, the remaining 70 gaols which had turned obsolete were entirely shut down decades ago. Throughout the first half of the 20th Century, approximately 44 of the decommissioned gaols were mostly demolished to be replaced by new structures or left redundant in a state of ruin - for example Trial Bay Gaol (NSW Office of Environment & Heritage, 2010). On the bright side, there are 27 decommissioned heritage-listed gaols which are still in good shape and condition and are structurally sound. Ultimately, the 14 in-operation gaols will be decommissioned.

[1] To know more about the status of all heritage-listed Australian gaols, resources for comprehensive census data about penal institutions in Australia were searched. However, there was no central resource found on websites of the Ministry of Justice for Australia, nor on State-Heritage registers. Each state's website displays limited information about few of the former gaols. Thus, the researchers used Wikipedia's page: "List of prisons in Australia" which was the only comprehensive resource as a start. However, since Wikipedia is not a reliable source of information, the researchers validated each gaol's current status, and updated Wikipedia's page of Australia's Gaols and backed up the provided information with credible references.

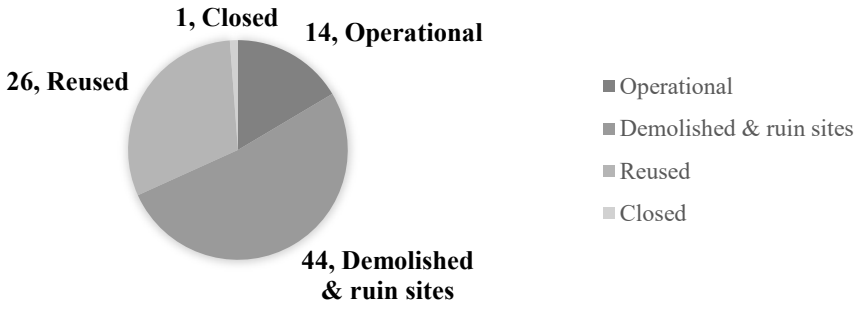


Figure 1. The current status of valuable gaols built before the 20th Century or those later but on the Heritage Register (data collected by the Authors).

When closed and by default, most heritage-listed gaols in Australia are preserved and converted to museums. Dozens of gaols which are scattered around the continent have caused an oversupply of dark tourism sites. Many of these 27 surviving gaols – including a gaol which is entirely closed – are underused and suffer neglect. Unlike Old Melbourne Gaol, which has been transformed to a penal museum receiving 177,000 visitors per annum (National Trust of Australia, 2013), income generated by tourists in many of these gaols scattered across the country is not enough to generate profit, threatening the necessary minimum for preservation and maintenance of the vast majority of this surviving gaol stock. Grants by State and Federal Governments had been flowing-in for decades to maintain and restore underused gaols as reported in many of the State Heritage Register – see for instance: NSW Heritage Office (2019) – or formal documentation published by local councils – see for instance: Mount Alexander Shire Council (2012). Adding to the burden, the most recent international travel restrictions to Australia's shores due to COVID-19 and the complete absence of foreign tourism (Department of Home Affairs, 2020) necessitates pumping-in money for the high-cost maintenance and preservation of heritage gaol museums, which is not a sustainable solution. Other economically viable reuse alternatives are now more important than ever.

Few examples defied the default transformation of decommissioned gaols into museums and were successfully adapted for reuse to different extents attesting their potential for long-term preservation through new life. Adaptive reuse of heritage buildings as a modern concept is a practical way of upkeeping old buildings to be part of cities' change, development, and growth. For instance, Bendigo Gaol was adaptively reused to have the largest theatre in regional Victoria and part of a local school (Hague, 2014; Shehata et al., in press); while Darlinghurst Gaol which was reused as an arts school in 1922 has just been included in a lease agreement to continue to function as the National Art School and being cared for until 2064 (Harwin, 2019). Commemorating the inclusive history of early incarceration narratives is indeed essential (Wilson, 2005, 2008, 2011; Witcomb, 2012), but nonetheless, sustaining these buildings for future generations by finding economically viable uses for (some of) them can also be acceptable as a trade-off (Shehata, Abu Arqoub, Langston, Elkheshien, & Sarvimäki, 2020). Most of the stock of heritage gaols in Australia are underused, thus facing threats of proper funding and falling into a state of ruin and despair.

Research plan

Adaptive reuse is a particular form of refurbishment that poses quite difficult challenges for designers (Douglas, 2006). Adding to that, balancing commemoration and the general interest in confinement on one hand, and reusing the remaining underused stock of

significant heritage gaols for socio-economic benefits on the other hand can be challenging. Every case by case has its own set of parameters, attributes, and contextual forces that set their potential for reuse (i.e. reusability factor). These parameters include but are not limited to architectural and urban configurations (Porro & Fransson, 2018), historical narrative significance (Menzies, 2017; Wilson, 2011), social interests (Smith, 2017), and spatial and size qualities (Zafra, 2017). Due to the complexity of these challenges, there is no way to prove that all remaining gaols are reusable. But hypothetically, if the least ranked gaol in terms of its potential for reuse is in fact 'reusable', then the remaining heritage gaols have more chance of being successfully reused to accommodate a vibrant new function.

To be able to test this hypothesis, *first*, the existing stock of gaols needs to be ordered according to their potential for reuse. Prioritizing adaptive reuse of heritage gaols in Australia by ranking them as mutually exclusive projects also increases possibilities of step-by-step transformations taking place. Similar to other building typologies (Langston, 2011b), ranking unused heritage gaols would assist decision-makers to quickly scan the available stock of gaols and to achieve better use of existing resources in analysis and design effort. Multiple levels of governments, i.e. State and Local and heritage authorities, can better orient budgets as well as development consortiums towards prioritised interventions in heritage gaols. *Secondly*, a concept design proposal is developed for the least ranked gaol in terms of its potential for reuse and then assessed by three locally registered architects and heritage consultancy offices. The first office provided the opinions of two architects and chose to be anonymous. Their opinions were expressed in one feedback session, thus are referred to here as 'Interviewees A&B'. The other two architects that provided project critique are Stephen Booker, (Director) of Carste STUDIO Pty Ltd, and Mike Verdouw (co-director) of 1+2 Architecture P/L. Online filled questionnaires were disseminated to the architects after the interviews to be used as a validation method (Groat & Wang, 2013). Discussion of the concept design will, besides revealing key design recommendations, question the reuse potential of the least ranked gaol. If proven possible, a higher possibility would exist for transforming the whole remaining stock of significant heritage gaols. Proving that all of the stock is adaptively reusable as a sort of mitigation and survival strategy would definitely assist preserving these buildings for future generations, and open possible community discussions of their optimum utilisation strategies on a case by case basis.

Ranking the Adaptive Reuse Potential (ARP) of heritage gaols

An existing and certified model is adopted and applied to order the stock of decommissioned heritage gaols in Australia. Previous research by Langston and Shen (2007) and Langston, Wong, Hui, and Shen (2008) has led to the Adaptive Reuse Potential (ARP) model, which ranks and prioritises projects for reuse. Since its development, the ARP model has been successfully validated (Langston, 2012). This model identifies and ranks opportunities for existing building reuse and enables the timing of any interventions to be predicted (Langston, 2011a). Through this model, seven obsolescence categories are conceptualised and measured using surrogate estimating techniques as no direct market evidence exists (Langston, 2012). The assessment of expected physical, economic, functional, technological, social, legal and political obsolescence leads to a combined 'discount rate' applied to physical life to determine useful life. A series of questions gives insight into the longevity of a building according to three primary criteria: environmental context (location), occupational profile (usage) and structural integrity (design). Each category is equally weighted, and comprises ten

questions requiring simple yes/no answers. Answers are weighted and computed into a 'physical life calculator' (a worksheet has been developed to assist with estimation). It is from this starting point that useful life is able to be forecast.

ARP scores in excess of 50 per cent have high adaptive reuse potential, scores between 20 per cent and 50 per cent have moderate potential, and scores below 20 per cent have low value, representing about one-third of the area under the decay curve in each case. Potential means that there is a propensity for projects to realise economic, social and environmental benefits when adaptive reuse is implemented. ARP is conceptualised as rising from zero to its maximum score at the point of its useful life, and then falling back to zero as it approaches physical life. Where the current building age is close to and less than the useful life, the model identifies that planning activities should commence.

The key algorithm in the ARP model has been validated against a large number of successful international adaptive reuse projects to show that predicted useful life closely resembles actual useful life. The ARP score serves as a means of benchmarking (identifying low, moderate or high potential for reuse in individual buildings), timing (understanding increasing or decreasing reuse potential and prioritising work) and ranking mutually exclusive projects (the higher the score, the more potential for reuse). It also identifies when planning should start and when adaptive reuse is not worthwhile. Since facility classification is an essential ingredient in project selection for adaptive reuse intervention (Langston, 2011b), the ARP model was applied on various facility classifications (building typologies): commercial, residential, retail, industrial, healthcare, educational, etc. in Langston (2011b), and on buildings in different contexts: urban and non-urban projects (Shen & Langston, 2010), but not yet for gaols.

Cases

To be able to come up with the list of gaols with potential for reuse, a set of criteria has been developed to exclude gaols which are not available for reuse (Table 1). Out of the remaining 27, 13 gaols matched the criteria and were considered in this study. The 13 existing gaols had their ARP scores calculated. The method used to calculate the ARP scores contained in the master list is known as the integrated model. It is computed via an Excel spreadsheet, based on inputs of physical life, date of construction or last major refurbishment, and seven obsolescence scores (physical, economic, functional, technological, social, legal and political). The calculations were based on extensive readings concerning each gaol, including their Conservation Management Plan (CMP), web page on the register of the State Heritage, the gaol's web site, photos available online, other credible resources such as online news, official reports by the Australian Government and local heritage councils.

Table 1. Criteria to exclude gaols

Criteria	Justification	Example(s)
Has viable use	Assuming that the contemporary reuse of these gaols is already viable, which reduces their need for another adaptive reuse in the near future.	Hobart Convict Penitentiary, and Bendigo Gaol
Land size less than 1,500 sq. metre	Extremely small land sizes are a strong limitation to adaptive reuse of old gaols.	Balranald, Normanton and Fannie Bay Gaols
UNESCO world heritage site and Commonwealth/National heritage listed gaols	High level of significance is a strong limitation to adapting old gaols for uses other than museums or event venues.	Fremantle Prison

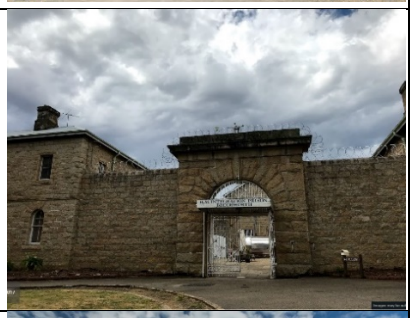
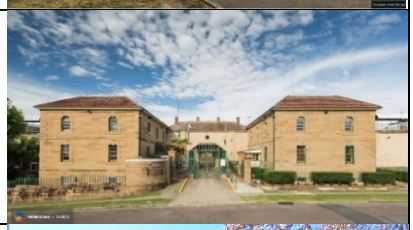
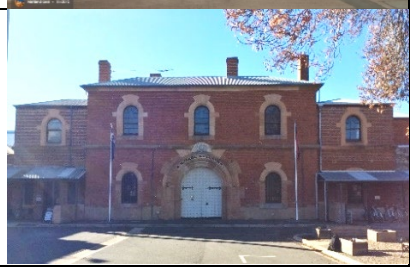
ARP Scores

Table 2 presents the ARP scores of all 13 case study gaols. Boggo Road Gaol scored the highest with the ARP score of 72.7%, followed by the Old Wentworth Gaol with the score 68.8%. The lowest rated ARP was Richmond Gaol with a score of 35.6% (Appendix 1). Richmond Gaol scored lowest among its peers on most obsolescence factors as explained below:

- Richmond Gaol is the oldest, resulting in its higher complexity in terms of its physical maintenance, hence scoring high in physical, as well as legal, obsolescence.
- Richmond Gaol lies in the smallest town of a total population of 1,464 with potentially the least economic interests and development pressures, something that explains its high economic obsolescence.
- Richmond Gaol has a relatively small cadastral parcel area of less than 7800 m^2 as property ID number 5886402 (Land Information System Tasmania, 2020), and the gaol's architectural typology is unique. Unlike Figure 2 showing 17th and 18th Century model of John Howard's Pentonville or even Jeremy Bentham's Panopticon gaol designs, Richmond's layout is a courtyard gaol in which the cell arrangement layout is rare. These two factors add to the gaol's functional obsolescence.
- Richmond Gaol's high value as perceived by the community to be a popular icon of Tasmania's heritage (Tasmanian Heritage Council, n.d.) adds to its political obsolescence reduction rates.
- The region of Richmond is characterised to be a cold and rainy climate, especially when compared to other regions in Australia, resulting in further reduction of Richmond's Gaol ARP score. This is supported by communications with Tasmania Parks and Wildlife Service (2020) stating that: "It is one of the oldest gaols in Australia, very damp Asbestos in the roof, FREEZING cold in winter, some rats too!"

Table 2. ARP scores for 16 former heritage gaols in Australia

#	Gaol	Operation	Arch. Typ.	ARP score	Photo thumbnail
1	Boggo Road Gaol, QLD Currently a museum and venue for events. City population: 2.28 million Photo by Authors	1883 - 1992	Radial cell blocks	72.7% adaptive reuse potential is high and decreasing	
2	Old Wentworth Gaol, NSW Currently a museum. City population: 145,949 Photo from google maps	1881 - 1928	Hay Type	68.8% adaptive reuse potential is high and decreasing	

3	Old Gladstone Gaol, SA Currently a museum and budget-hostel. Town population: 629 Photo from google maps	1881 - 1975	Cell blocks	62.5% adaptive reuse potential is high and decreasing	
4	Hay Gaol, NSW Currently a museum and centre for Australia Day celebrations. Town Population: 2,406 Photo from google maps	1880 - 1974	Hay Type	60.2% adaptive reuse potential is high and decreasing	
5	Castlemaine Gaol, VIC Currently closed. Town population: 6,757 Photo from google maps	1857 – 1990	Pentonville	57.4% adaptive reuse potential is high and decreasing	
6	HM Prison Geelong, VIC Currently a museum. City population: 184,583 Photo from google streetview	1853 - 1991	Pentonville	56.3% adaptive reuse potential is high and decreasing	
7	(Old) HM Prison Ararat-J Ward Asylum for criminally insane, VIC Currently a museum and venue for events. City population: 8,297 Photo from google streetview	1859 - 1991	Pentonville	55.7% adaptive reuse potential is high and decreasing	
8	(Old) Beechworth Gaol, VIC Currently a museum and venue for events. Town population: 2,789 Photo from google streetview	1864 - 2004	Pentonville	55.4% adaptive reuse potential is high and decreasing	
9	Maitland Gaol, NSW Currently a museum and venue for events. City Population: 67,478 Photo from google streetview	1849 - 1998	Cell blocks	50.5% adaptive reuse potential is high and decreasing	
10	Adelaide Gaol, SA Currently a museum City population: 1.306 million Photo by Authors	1841 - 1988	Pentonville	41.8% adaptive reuse potential is moderate and decreasing	

11	Parramatta Correctional Centre, NSW Currently a museum and film shooting scene. City Population: 5.23 million Photo from google maps	1842 - 2011	Radial	41.1% adaptive reuse potential is moderate and decreasing	
12	(Old) Dubbo Gaol, NSW Currently a museum and venue for events. City Population: 38,943 Photo from google maps	1871 - 1966	Hay Type	36.5% adaptive reuse potential is moderate and decreasing	
13	Richmond Gaol, TAS Currently a museum Town population: 1,464 Photo from google maps	1825 - 1945	Courtyard	35.6% adaptive reuse potential is moderate and decreasing	

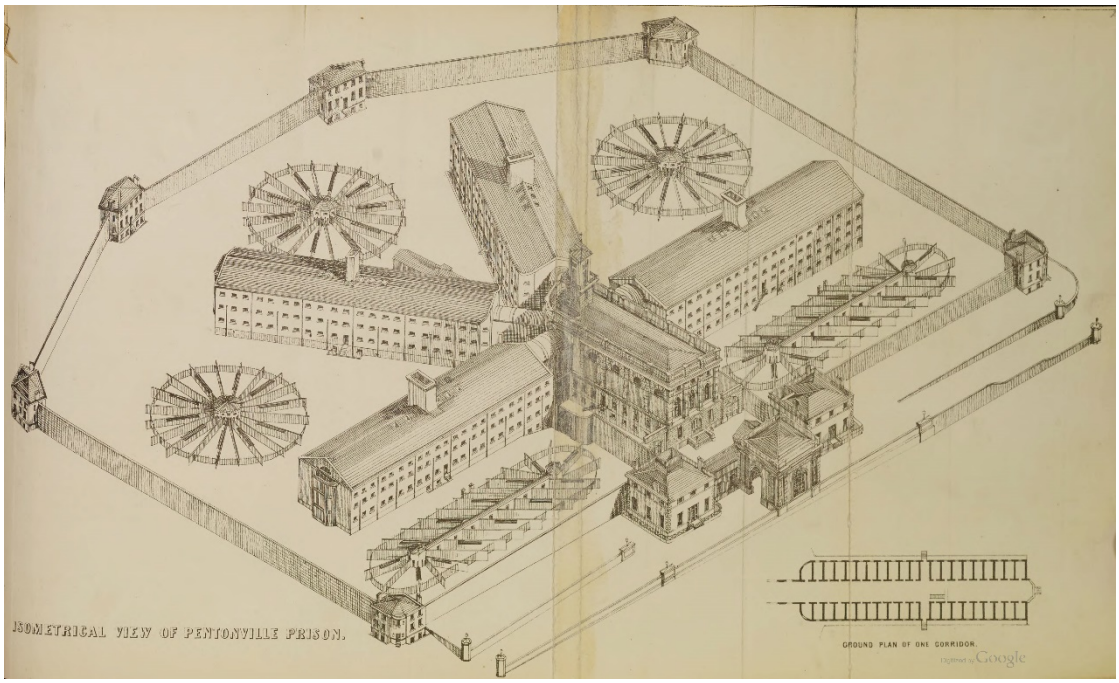


Figure 2. Isometrical view of Pentonville Prison showing the typical features of long radiating wings and single cells. Image source: Adshead (1845), digitised by Google.

Richmond Gaol

Historical background & significance

From the mid 1820s a burst of building activities in Richmond, Tasmania, required large numbers of convict labourers, and so a local place of imprisonment was needed for those

who committed offences while employed on the new public works. Besides this, the surrounding rural properties also involved a large number of assigned convicts who acted almost as slave labour. These factors marked the beginning of Richmond Gaol construction in 1825. The first stage of construction commenced in 1825. Most of the key features seen at Richmond Gaol today were constructed over a 15-year period between 1825 and 1840 ("Historic Richmond Gaol-Official Website," n.d.). It was constructed on the west bank of the Coal River on a hill, overlooking the southern river valley. In common with most of Richmond's picturesque buildings, the gaol was constructed of local sandstone (Tasmanian Heritage Council, n.d.) from a nearby quarry (Ritchie, 2012). The gaol and Gaoler's house are of sandstone walls, corrugated iron hipped roof and 12 paned double-hung windows. Behind this main facade is a walled gaol with an internal courtyard (Figure 3).

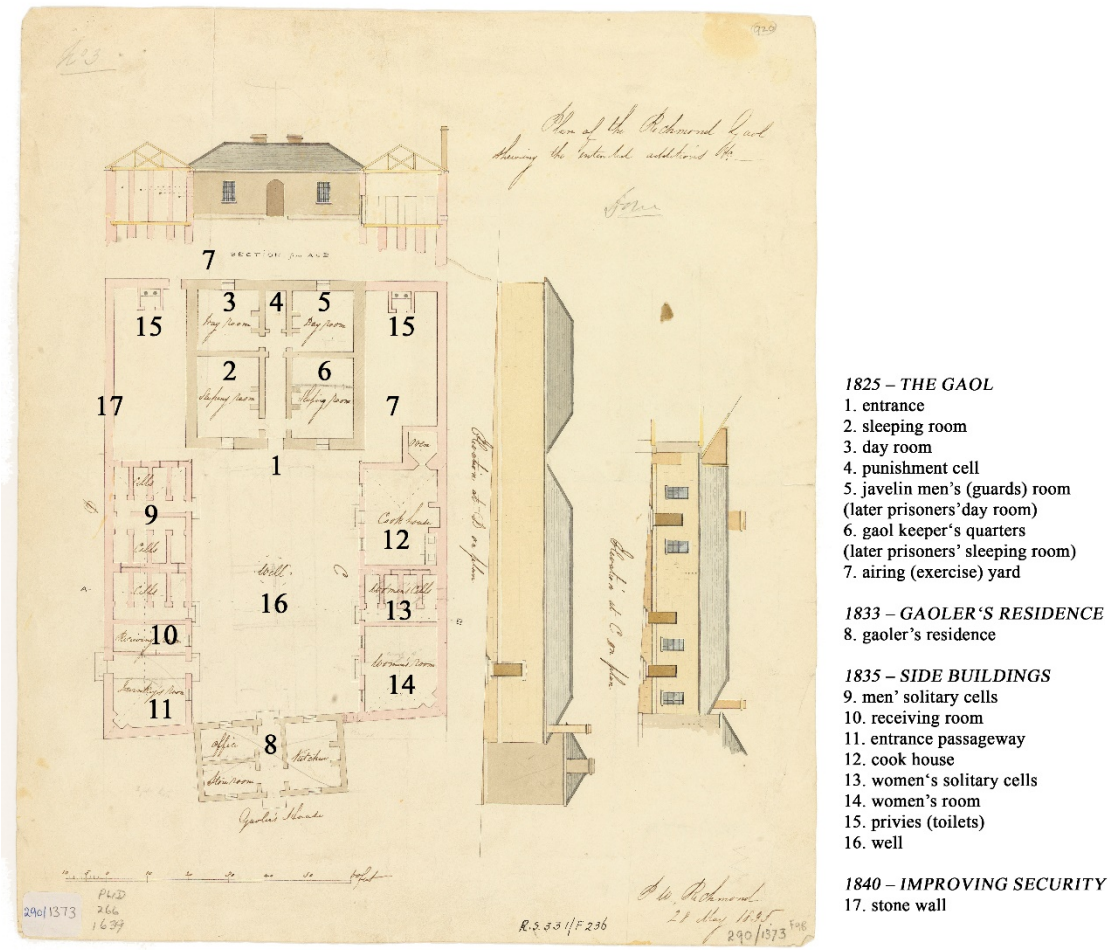


Figure 3 Annotated existing plan. Adapted after The Department of Public Works (1895).

The gaol started small as a courthouse, servicing the police district in the area (Richmond Tasmania, 2020). In 1898, the use of the gaol declined until it closed its doors in 1928. The site became a state reserve under the control of the Scenery Preservation Board in 1945. Preservation decision of the gaol and its land was decided in 1945 ("Preservation Of Old Richmond Gaol," 1945), but funding was allocated for the repairs of the gaol with the intention of converting it to a museum a year after ("Historic Richmond Gaol Being Repaired," 1946). There have been some calls in the 1950s to transfer it to Juvenile Centre (Bethune, 1953), but these calls were halted by the Government guide of the gaol, claiming that it would cost a fortune to change the freezing and tight cells and provide

sanitation (Rait, 1953). When the Tasmanian Parks and Wildlife Service was declared in 1971, the gaol was registered as a historic site in the Tasmanian Heritage Register with the ID# 1074. It has been privately leased since 1987 and has been open as a museum since then ("Historic Richmond Gaol-Official Website," n.d.). Richmond Gaol is the oldest, still intact, Colonial Georgian-style gaol in Australia, as it predates the penal colony at Port Arthur by five years.

Adaptive reuse concept design proposal

Function and Program

The new function of boutique hotel was selected by the researchers following the notion of minimum intervention. Rooms which were used to accommodate the prisoners, in the first instance, were thought to be adapted to accommodate hotel guests. The detailed functional program (Table 3) was developed after a quick review of worldwide examples of converting prisons to hotels, such as Het Arresthuis Hotel in Roermond, Netherlands; Malmaison Oxford in Oxford, United Kingdom; Old Mount Gambier Gaol in South Australia; and The Liberty Hotel in Boston, Massachusetts, USA – for an overview see Weller (2017).

Table 3. Initial functional program

Zone	Features and spaces
Reception	Reception desk
	Lounge
	Toilets
Gym	
Spa	Sauna
	Jacuzzi
	Steam
Cafe' serving breakfast	Indoor dining
	Outdoor dining
	Preparation kitchen
Multi-purpose hall	Indoor meeting space
	Outdoor space(s)
Hotel rooms	6 Boutique rooms - ensuite bathroom
	9 New Hotel rooms – ensuite bathroom

Design

A conceptual design proposal was prepared as part of this research in March-April 2020. Section 9.0 “Alterations, additions and extensions” in the Work Guidelines set by Tasmanian Heritage Council was considered; see Heritage Tasmania (2015). To accommodate the new additions of the hotel rooms, a brief value study by the researchers concluded that the roof of the side wings of the existing gaols – despite their originality – were not of rare value. Thus, a vertical and contemporary extension was proposed on top of these side wings. The north-western courtyard was the proposed location to place the hotel reception desk and lounge, and also to provide access for people with disabilities to the gaol. Figure 4 is a mass-diagram which shows the proposed locations of these additions and extensions. The oldest part of the gaol, along with the Gaoler’s house were minimally adapted to accommodate the boutique rooms, while the rest of the ground floor was adapted to house the hotel amenities, and inserted vertical transportation leading to the new additions (Figure 5). This design proposal was prepared using AutoCAD 2018, 3D-max 2020, and Adobe Photoshop CC software (Figure 6).

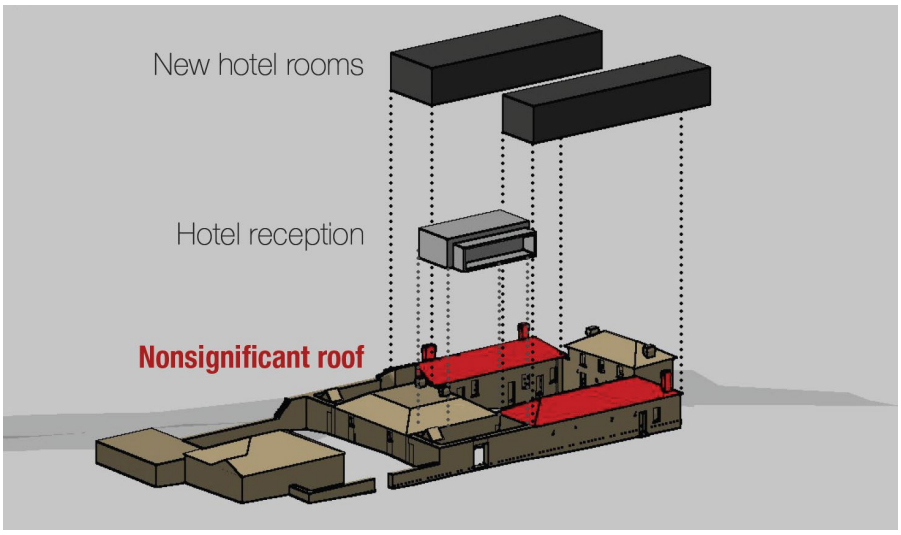


Figure 4. Proposed vertical extension in the initial concept design.

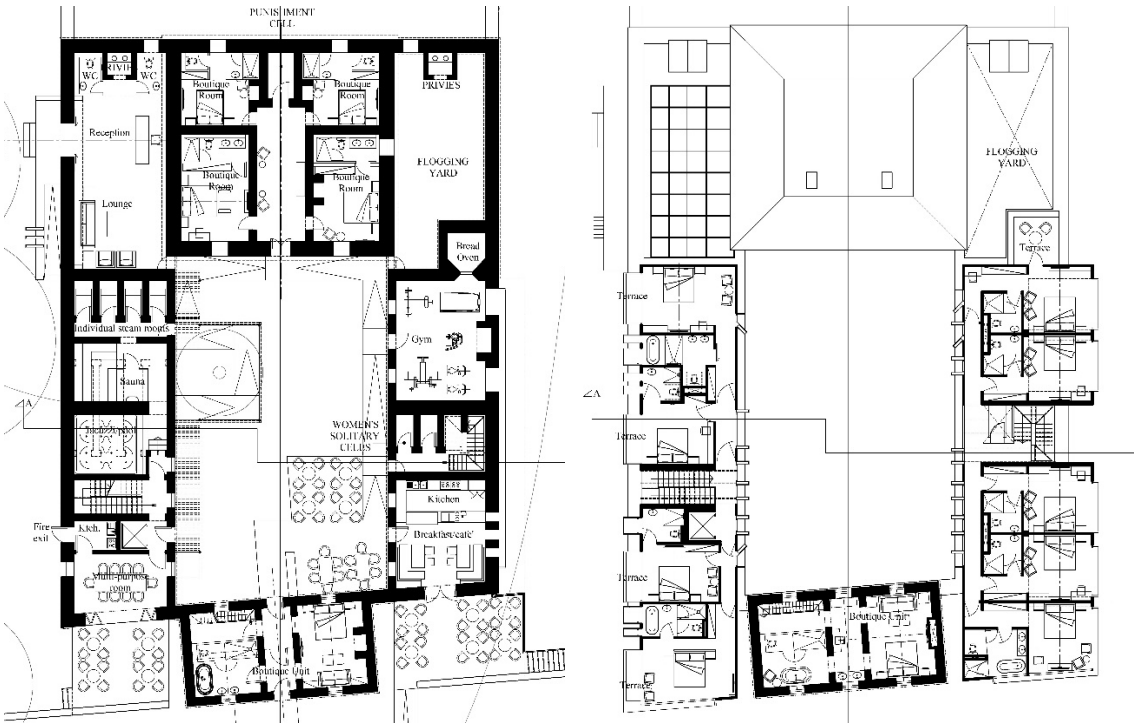


Figure 5. Ground floor plan (left) and first floor plan (right). Drawings not to scale

Figure 6. Artist impression of the proposed adaptive reuse of Richmond Gaol.

Limitations of data collection

Due to the continuing closure of Tasmania's state borders amid the spread of the COVID-19 virus, the researchers were not able to travel to Tasmania to conduct a site visit and to run the in-depth interviews with the architects in person. Most of the data of the current status of the site, its current layout, museum elements, historical data, and photos were provided by Heritage Authorities in Tasmania and the Tasmanian State Library and Archive Service. Supplementary information and photos were acquired in February 2020 from visitors of the gaol who uploaded their trip images to google maps or to their travel blogs. Topographical data of the site was gathered from Topographic Base-map of Land Information System Tasmania (2020). Due to travel restrictions, in-depth interviews with the local architects were done virtually, or over the phone in one case.

Discussion

The following part highlights and synthesis main themes as per the in-depth interviews with the professional heritage architects.

Intervention criteria

There has been a general agreement among all interviewed architects that the intervention was intense and detracting from the gaol's townscape value: "quite a bold intervention, that spills outside of the existing building envelope" quoting from Interviewees A&B (2020). Verdouw (2020) and Booker (2020) clearly added that the Heritage Council in Tasmania would definitely have major concerns regarding this design proposal. All of the interviewed heritage architects also agreed that the roof structure is an important element where Booker (2020) emphasised that it would be hard to reverse the action of removing it. Booker added that the vertical additions change the context of the original Gaoler's house and the way it looks from the courtyard. Booker (2020) and Interviewees A&B (2020) agreed that the new uses with intensive technical requirements (i.e. air conditioning and water heating for the spa) would be better placed outside of significant heritage fabric and into a modern annex, and not in a vertical extension as initially proposed. Ultimately, all interviewed architects complemented the use of contemporary and lightweight materials, such as steel and the effort that was put in the preservation of the heritage walls, achieved by differentiating old walls from new ones and with the use of freestanding furniture.

Maintaining evidence of the goal's history

All interviewed architects stressed the importance of maintaining evidence of the goal's original function, ones that can present significant portions of its history despite not agreeing what these elements would be or how that would be done. A general comment by Verdouw (2020) implied that the gaol's carceral history is generally not preserved nor presented enough in the design proposal. Interviewees A&B (2020) emphasised the specific importance of preserving the sense of "enclosure" that characterises "imprisonment" and commented on the open views of the contemporary hotel rooms, in contrary to the notion of containment and incarceration. They also perceived the added entrance of the boutique hotel to be too grand, which departs from the sense that the prisoners have experienced at the time while entering the gaol from the current humble entrance. Commenting on another element, Booker (2020) stressed the significance of preserving and presenting solitary cells as a fundamental characteristic of the goal that must be maintained.

Architectural compatibility of the new function

The classification to which the gaol's form belong is shown to be a key factor in the adaptation process, and in which selecting a compatible new use is essential. Booker (2020) and Interviewees A&B (2020) agreed that a better approach towards the adaptive reuse of Richmond gaol is to maintain the building in its entirety, which means modifying as little as possible. According to Interviewees A&B (2020), a conversion of a typical Pentonville model to a hotel would be easier due to the similarity of a layout configuration of a Pentonville to a hotel design; composed of primarily a central hall leading to single or double-loaded corridors rooms. In a Pentonville layout, opening up two prison cells or more could form a single boutique hotel room and its amenities. However, in the case of Richmond Gaol, the layout of the two side wings did not enable such smooth conversion, as their internal spaces are custom-designed for multiple uses ranging from tight solitary cells to large cooking area. Booker (2020) Interviewees A&B (2020) agreed that converting Richmond Gaol as is, or part of it into a cottage-style bed-and-breakfast accommodation would be recommended. Based on that approach, they commended the ability of the proposal to convert the Gaoler's house and the oldest part of the gaol north of the site into a very close model of a bed-and-breakfast accommodation cottages. Booker (2020) showed confidence in the possible achievement of a boutique hotel in Richmond Gaol. He commented that the modern extension that would house the additional contemporary rooms could sit on the Eastern side of the goal and blend into the topography of the site without affecting the gaol's townscape value. He also mentioned the possible acquisition and utilisation of the land parcel on the Northern end of the site if the nonsignificant police station currently on it would be demolished.

Financial viability

The interviewees' opinions varied with regard to the financial viability of the project. Interviewees A&B (2020) stated that Richmond gaol presents itself on a relatively small scale for a boutique hotel, a function that tends to be feasible around a "sweet spot" figure of 21 rooms. Considering his local experience, Booker (2020) indicated that the function of a boutique hotel would be a viable option for the town of Richmond because of the Midland highway tours. To increase the viability of other project components such as the café, he suggested flipping the café with the multi-purpose room explaining that both locals and tourists tend to walk through the town's road, which would give the café a more robust presentation to a well-used public domain. The café would represent vibrant support to the economic viability of the project, ensuring and helping to speed up the cost recovery even quicker than anticipated. Table 4 presents a basic feasibility study that shows the financial viability of the project after incorporating the above comments and achieving a total of 21 rooms.

Table 4. Adjusted feasibility study

Key Inputs

No. of hotel rooms	21 rooms
Price per room night	250 AUD
Vacancy rate	25 %
Development cost	10 AUD million
Real discount rate	2 %

Discounted Cash Flow

Year	*Income*	*Discounted Income*	*Expenditure*	*Discounted Expenditure*	*Net Benefit*
0	0	0	10,000,000	10,000,000	-10,000,000
1	1,437,188	1,409,007	200,000	196,078	-8,787,071
2	1,437,188	1,381,380	200,000	192,234	-7,597,925
3	1,437,188	1,354,294	200,000	188,464	-6,432,096
4	1,437,188	1,327,739	200,000	184,769	-5,289,126
5	1,437,188	1,301,705	200,000	181,146	-4,168,567

6	1,437,188	1,276,181	200,000	177,594	-3,069,980
7	1,437,188	1,251,158	200,000	174,112	-1,992,934
8	1,437,188	1,226,626	200,000	170,698	-937,006
9	1,437,188	1,202,574	200,000	167,351	98,217
10	1,437,188	1,178,994	200,000	164,070	1,113,142
		12,909,659		11,796,517	

Benefit-Cost Ratio (BCR): **1.09** *(where 1 = breakeven point)*

Conclusion

This research experiments the reusability of underutilised Heritage-listed Gaols in Australia, a topic that has never been systematically and comprehensively tested. While doing so, this research provides a rare case of employing architectural design part of an empirical research methodology to provide evidence of the reusability of a building typology. This research has two stages. First, all of the underused gaols were rated by the ARP model, a tool which has been demonstrated to be applicable for ranking Australia's heritage-listed gaols. Secondly, Richmond Gaol in Tasmania, the least ranked gaol was tested for reuse. Despite the constraints and limitations of repurposing Richmond Gaol such as its small size, historical significance as an early 19th Century gaol, its existence in a small county town, its unusual form and layout, and perhaps above all the strict heritage restrictions and framework protecting invasive interventions in its structure, its adaptive reuse to a vibrant function has been shown to be achievable. Professional architects generally agree that Richmond Gaol 'can' be adaptively reused to a boutique hotel. This finding steps outside of the boundary of the town of Richmond to demonstrate not only the reusability of the least rated gaol on the ARP scale but also a higher chance of reusing the entire stock of underutilized heritage gaols in Australia. Proposing a boutique hotel for the least ranked gaol showed it to be a feasible option; nonetheless, finding a universal solution that works out for the entire gaol stock would be an impractical proposition. The assessment of the concept proposal presented here aims to provide an architectural-heritage discussion that besides revealing exclusive case-study related recommendations, also guides future transformations of heritage gaols.

Low pressures for investments similar to the case of Richmond Town, when compared to metropolitan areas, make adaptive reuse perceived as less feasible, which in this case may turn out to be more expensive than purchasing empty lands and building new. Overcoming these constraints requires an active collaboration of wills and expertise to plan and execute a successful heritage revitalisation project. Reuse can and should be a goal, where part of the effort reaching it is getting in terms with principles that reflect broader goals such as community attachments, former history, things which overweight just immediate economic expediency. The difficulty of reusing Richmond Gaol suggests that heritage gaols which are on the lowest range of ARP model, perhaps before others, would benefit from government funding opportunities and enhanced tax concessions that can be accessed when pursuing an adaptive reuse strategy. In some cases, exemptions for increasing the floor space ratios can be obtained for pursuing government policy directions by regenerating derelict public assets. Programs that set incentives and tax reductions by federal, state, and local governments would now have more trust to invest more potential in the adaptive reuse of heritage gaols.

Ethics approval

The research has been granted ethics clearance by Bond University Human Research Ethics Committee under the ethics application number WS00014. Consent forms of participants in this research can be provided upon request.

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Appendix. The ARP model worksheet of Richmond Gaol

Physical life worksheet

suggested forecast (years) = **250**

Richmond Gaol

Richmond, Tasmania

			y/n ?
environmental context	Is the building located within 1 kilometre of the coast?		N
	Is the building site characterised by stable soil conditions?	#	Y
	Does the building site have low rainfall (<500mm annual average)?		N
	Is the building constructed on a 'greenfield' site?		N
	Is the building exposed to potential flood or wash-away conditions?		N
	Is the building exposed to severe storm activity?		N
	Is the building exposed to earthquake damage?		N
	Is the building located in a bushfire zone?		N
	Is the building located in an area of civil unrest?	#	N
	Are animals or insects present that can damage the building fabric?	#	N
occupational profile	Is the building used mainly during normal working hours?		N
	Are industrial type activities undertaken within the building?	#	N
	Is the building open to the general public?		N
	Does the building comprise tenant occupancy?		Y
	Is a building manager or caretaker usually present?	#	Y
	Is the building intended as a long-term asset?	#	Y
	Does the building support hazardous material storage or handling?		N
	Is the building occupation density greater than 1 person per 10 m^2?		N
	Is the building protected by security surveillance?		Y
	Is the building fully insured?		N
structural integrity	Is the building design typified by elements of massive construction?		N
	Is the main structure of the building significantly over designed?		N
	Is the building structure complex or unconventional?		N
	Are building components intended to be highly durable?	#	Y
	Are there other structures immediately adjacent to the building?		N
	Does the building have a stable footing system?	#	Y
	Was the workmanship standard for the project high?		Y
	Is the building properly weatherproofed from water entry?	#	Y
	Is the building protected against accidental fire events?		N
	Is the building designed as a public monument or landmark?		Y

Notes:
Questions indicated (#) are double weighted

Adaptive reuse potential

adaptive reuse potential (ARP%) = **35.6**

Obsolescence context ...

physical life (L_p) =	250 years	index =	250
building age (L_b) =	185 years	override =	
original construction date	1835	today's date =	2020
last refurbishment date =	1835	(enter only if refurbishment was major)	
physical (O_1)	0.10		
economic (O_2)	0.20		
functional (O_3)	0.15		
technological (O_4)	0.20		
social (O_5)	0.20		
legal (O_6)	0.10		
political (O_7)	0.05		
total =	1.00	obsolescence rate pa =	0.40
useful life (L_u) =	92.2 years	adaptive reuse potential is moderate and decreasing	
years to useful life =	-92.8 years		
maximum arp score (%) =	86.4	(assuming $L_u = L_b$)	
ARP difference (%) =	142.8 %		

Risk Management: **nil**

best case obsolescence =	0.60 (low)	
useful life (L_u) =	137.3	
ARP% =	40.3	adaptive reuse potential is moderati (no change) and decreasing
worst case obsolescence	0.90 (high)	
useful life (L_u) =	101.8	
ARP% =	36.6	adaptive reuse potential is moderati (no change) and decreasing
ARP difference (%) =	9.2	

Notes: